

Claims

1. A MOCVD deposition apparatus for producing a multi-layer coated substrate comprising
a vacuum chamber;
a heater;
a showerhead delivery apparatus selected from the group consisting of a multi-compartment showerhead and at least two single compartment showerheads;
at least one precursor delivery system; and
a substrate translation system
where the space between the showerhead and the heater defines an extended length deposition zone within the vacuum chamber in which successive layers of a coating are deposited.
2. The apparatus of claim 1 where two or more compartments in the multi-compartment showerhead are connected to a single precursor delivery system.
3. The apparatus of claim 1 where each compartment in the multi-compartment showerhead is connected to a separate precursor delivery system.
4. The apparatus of claim 1 where the at least one precursor delivery system comprises a source of liquid precursors, a pump, a source of inert gas, a precursor vaporizer, and a source of oxygen.

5. The apparatus of claim 1 where there are two or more precursor delivery systems, each comprising a source of liquid precursors, a pump, a source of inert gas, a precursor vaporizer, and a source of oxygen.

6. The apparatus of claim 1 where the multi-component showerhead has from two to seven compartments.

7. The apparatus of claim 1 where the multi-compartment showerhead has five compartments.

8. The apparatus of claim 7 where the compartments have different delivery lengths.

9. The apparatus of claim 1 where the heater is a multizone heater.

10. The apparatus of claim 9 where the heater comprises one zone for each compartment of the multi-compartment showerhead.

11. A process for producing multi-layer coated substrates comprising translating a substrate to be coated through a MOCVD chamber comprising a vacuum chamber, a heater, a showerhead delivery apparatus selected from the group consisting of a multi-compartment showerhead and at least two single compartment showerheads, at least one precursor delivery system, and a substrate translation system, where the

space between the showerhead and the heater defines an extended length deposition zone within the vacuum chamber

and where the substrate translating through the extended length deposition zone is heated by the heater and successively impinged upon by vaporized precursors exiting each of the individual showerhead compartments to deposit a coating thereon.

12. The process of claim 11 wherein the vaporized precursors delivered through each showerhead compartment are the same.

13. The process of claim 11 wherein multi-layered substrates are produced by delivering different types of vaporized precursors through one or more showerhead compartments.

14. The process of claim 11 wherein the vaporized precursors are selected from the group consisting of YBCO, SmBCO, and other rare earth mixed oxides.

15. The process of claim 11 where the total thickness of the coating exceeds 1.5 microns and the coated substrate has a critical current of at least 100 Amperes/cmwidth.

16. The process of claim 11 where the thickness of each coating layer is no greater than 1.5 microns.

17. A multi-coated substrate tape prepared by the process of claim 11.

18. The substrate of claim 17 where the multi-coated substrate has at least two coatings of different composition deposited thereon.

19. The substrate of claim 17 where the substrate is coated with successive layers of YBCO, SmBCO, YBCO, SmBCO and YBCO.

20. The substrate of claim 17 where the total thickness of the coating exceeds 1.5 microns and the coated substrate has a critical current of at least 100 Amperes/cmwidth.

21. The substrate of claim 17 where the thickness of each coating layer is no greater than 1.5 microns.

22. A MOCVD deposition apparatus for producing a multi-layer coated substrate comprising

a vacuum chamber;

a multi-zone heater;

a multi-compartment showerhead having a number of compartments equal to the number of zones in the multi-zone heater;

a separate precursor delivery system connected to each compartment of the multi-compartment, each comprising a source of liquid yttrium-barium-copper precursors, a pump, a source of inert gas, a precursor vaporizer, and a source of oxygen; and

a substrate translation system

where the space between the showerhead and the heater defines an extended length deposition zone within the vacuum chamber in which successive layers of a coating are deposited.